Aug. 5. 1924. 1,503,830

G. HINEMAN

SKY WRITING DEVICE

Filed March 12, 1924 3 Sheets-Sheet 1

Fig. 1

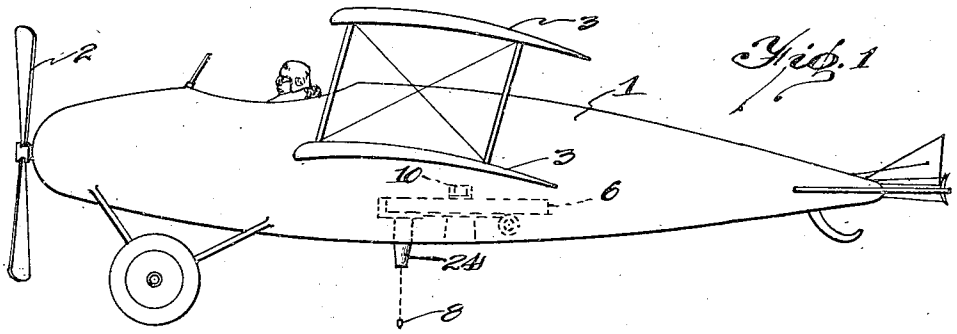



Fig. 2

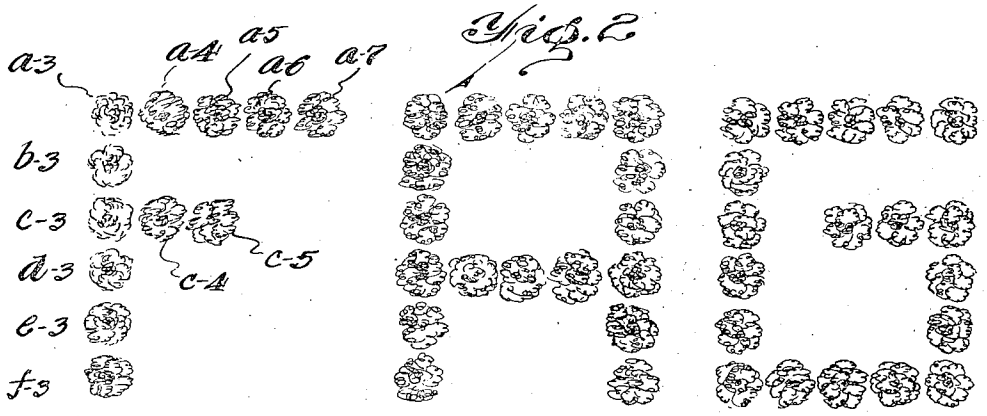
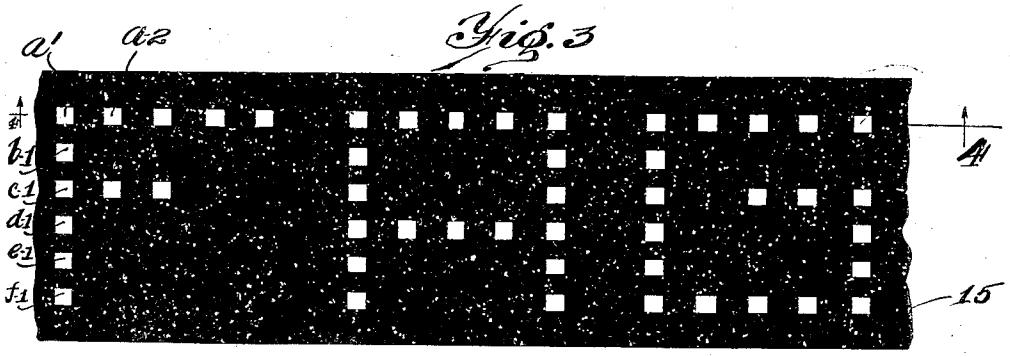
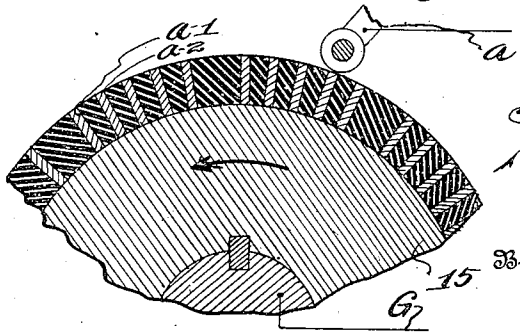



Fig. 3




Developed Length of Armature

Fig. 4




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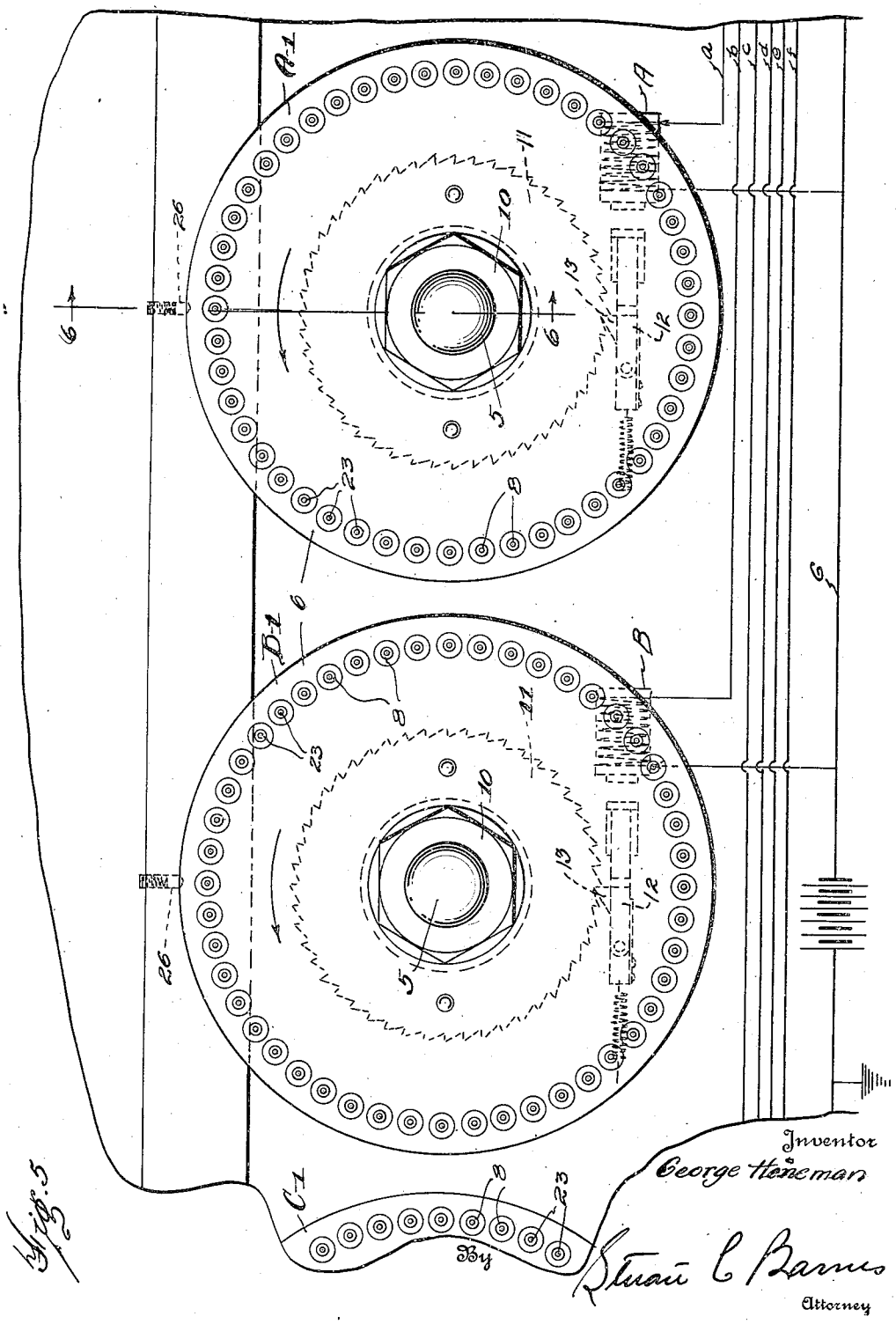



Fig. 5

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SKY WRITING DEVICE

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Fig. 6

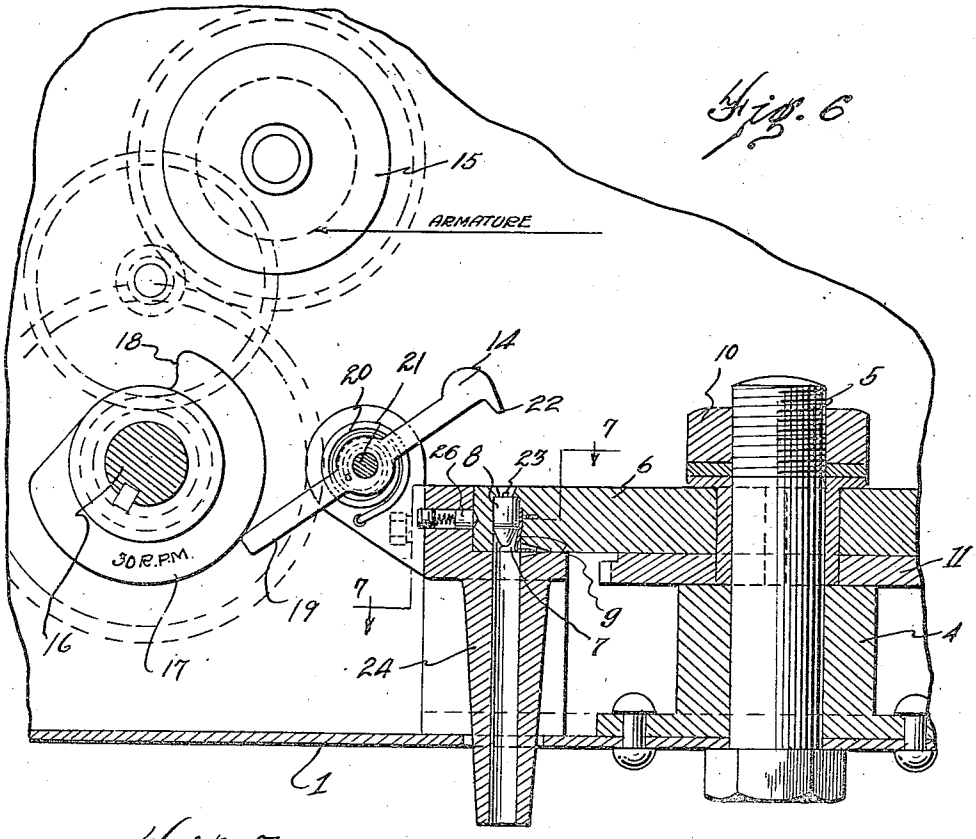



Fig. 7

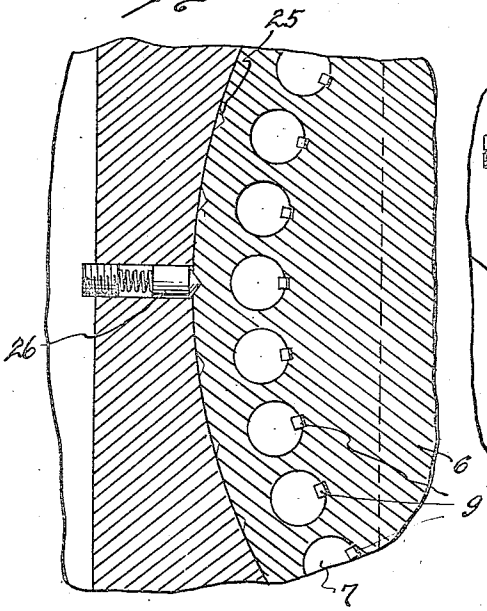
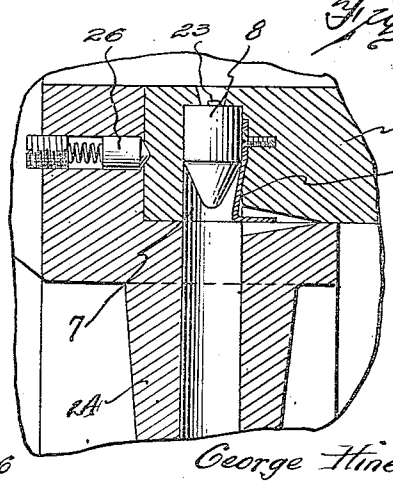



Fig. 8




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Patented Aug. 5, 1924. 1,503,830

# UNITED STATES PATENT OFFICE.

GEORGE HINEMAN, OF ANN ARBOR, MICHIGAN.

## SKY-WRITING DEVICE.

Application filed March 12, 1924. Serial No. 698,585.

*To all whom it may concern:*

Be it known that I, GEORGE HINEMAN, a citizen of the United States, residing at Ann Arbor, in the county of Washtenaw and State of Michigan, have invented certain new and useful Improvements in Sky-Writing Devices, of which the following is a specification.

This invention relates to a sky writing device for automatically writing words, numerals or pictures in the sky with the use of smoke.

Every one is familiar with the stunt of sky writing which employs the use of a stream of smoke which is projected from an areoplane at high altitudes. This form of sky writing requires great skill in the manipulation of the aeroplane.

It is my object to provide a device carried by the aeroplane which will automatically project a plurality of smoke bombs so timed and controlled that they will explode at different altitudes and in different positions in the sky so that when exploded these bombs will clearly describe a letter or figure in the sky which can be plainly seen from the ground. A still further object is to provide an automatic control whereby these bombs are projected at predetermined time intervals thus requiring less skill on the part of the aviator in performing the stunt. It is merely necessary for the aviator to proceed in a straight course at a steady speed, the bombs being automatically projected and so timed as to explode at the proper time to describe a letter or design in the sky.

It is possible to use smoke bombs of different color when it is desired to display a rather attractive design in the sky.

In the drawings:

Fig. 1 is an elevational view of an aeroplane having my device mounted therein.

Fig. 2 is a diagrammatic view showing the result obtained by the exploding of the smoke bombs.

Fig. 3 is a detail showing the developed length of the armature for controlling the projecting means.

Fig. 4 is a section through the armature.

Fig. 5 is a plan view of the magazines carried by the aeroplane and the controlling means thereof.

Fig. 6 is a vertical section on the line 6—6 of Fig. 5, showing the means for firing the smoke bombs.

Fig. 7 is a horizontal view on the line 7—7 of Fig. 6.

Fig. 8 is an enlarged detail showing the means for holding the bombs in place in the magazine.

An aeroplane is provided with the usual fuselage 1, the propeller 2, and wings 3. Rotatably supported on the fuselage 1 is a standard 4, and the bolt 5 rotatably supports the magazine 6. This magazine is provided with a plurality of recesses 7 in which the bombs 8 are set. A spring clip 9 normally holds the bombs in place within the recesses. These magazines are adapted to carry a large number of bombs and may be readily removed when the magazine is exhausted by unscrewing the nut 10 and replacing the exhausted magazine with a loaded one.

Secured to the under side of the magazine is a ratchet wheel 11, which is provided with the same number of teeth as are recesses in the magazine. A trigger 12 is provided with a tooth 13, which is adapted to engage one of the teeth of the ratchet wheel and suitable magnets are provided for actuating the trigger at predetermined time intervals for partially rotating the magazine so as to bring the recesses containing the bombs into alignment with the hammer 14. An armature 15 is carried at any convenient place in the machine and is rotated at a slow speed. The ground wire G is electrically connected with the central shaft of the armature and the wires $a$, $b$, $c$, $d$, $e$ and $f$ are each connected to a brush or roller which is adapted to make contact with the contact points $a^1$, $b^1$, $c^1$, $d^1$, $e^1$ and $f^1$. The electrical conduit wire $a$ is connected to the magnet A, the wire $b$ connected to the magnet B and similarly the wires $c$, $d$, $e$ and $f$ are connected to corresponding magnets for controlling the other magazines. It is understood that any number of these magazines may be employed. Each magazine being controlled by a series of contacts, but in the drawings I have not shown the full number of magazines but have merely shown a couple. I wish it understood that the others are similarly constructed and are similarly actuated. I will describe in detail the construction of one of the magazines, more particularly that one controlled by the magnet A. As the roller $a$ passes over the contact points $a^1$, the magnet A is energized and pulls the trigger 12 to the

right (see Fig. 5). This causes the tooth 13 to rotate the ratchet wheel 11 the distance of one tooth and thereby rotate the magazine so as to bring another recess in alignment with the hammer 14. The rotation of the armature is such that the roller $a$ requires two seconds of time to travel between two adjacent contacts $a^1$ and $a^2$. It is obviously understood that this time interval could be varied if the other timing apparatus is varied accordingly. It is easier to describe a specific timing of the device so that the examiner may fully understand the operation of the machine.

A shaft 16 has keyed or otherwise secured thereto a number of cams 17 (see Fig. 6). There is one cam for each magazine and a trigger 14 for each magazine. The trigger 14 is adapted to engage this cam and to be normally held in a raised position, as shown in Fig. 6. This cam is timed to rotate at a speed of 30 R. P. M. As the cam rotates in the direction shown by the arrow it will bring the recessed part of the cam, 18, under the hammer arm 19 and allow the hammer arm to be released, a strong coil spring 20 causing the hammer to rotate in a clockwise direction. These hammers 14 are pivoted on the stationary shaft 21, and when the hammer is propelled by the coil spring 20, the hammer point 22 strikes the firing pin 23 carried by the bombs 8. This causes the bomb to be projected from out of the barrel 24. The periphery of the magazine is provided with a plurality of centering recesses 25 in which the spring-pressed pin 26 is adapted to engage so as to correctly align the recesses 7 of the magazine with the barrel 24. These hammers are adapted to strike at intervals of two seconds and are so timed as to be actuated after the magazine has been rotated so as to bring one of the recesses 7 carrying one of the bombs in alignment with the hammer. If it is desired to fire another bomb from this magazine at an interval of two seconds the contacts $a^1$ and $a^2$ are so spaced that the magnet A will be again actuated at a two-second time interval and a new bomb will be carried in position, so that when the hammer strikes another bomb will be projected. In Fig. 2 I have shown diagrammatically how these bombs will form letters when they explode. I employ 6 magazines, although this may be varied if it is so desired. 6 magazines, however, will do the trick, and in forming the letters I will describe how the first letter "F" is formed. At a certain time bombs are fired from all six of the magazines, the bombs contained in the magazine $A^1$ are so timed that they will explode in 10 seconds after being fired. The position of this bomb when exploding will be such that it will form that part of the letter designated $a^3$. The bomb fired from the magazine $F^1$ is so timed as to explode after 20 seconds, and it is to be noted that these bombs are fired downwardly, therefore the bomb fired from magazine $F^1$ would travel farther than the bomb fired from the magazine $A^1$, and when it is exploded will form that portion of the letter designated $f^3$. The bombs fired from the intermediate magazines, viz: $B^1$, $C^1$, $D^1$ and $F^1$ are so timed as to explode after 12 seconds, 14 seconds, 16 seconds and 18 seconds. This will cause the bombs to successively explode and when exploded will form the vertical lines of the letter "F". The aeroplane is traveling in a horizontal direction at a speed of approximately 100 miles per hour, and in two seconds of time it will have traveled a distance of approximately 300 feet. At this time the magazines $A^1$ and $C^1$ are actuated, the hammers are again tripped and bombs are fired from these magazines and they are timed to explode as before and form that part of the letter "F" designated $a^4$ and $c^4$. The magazines $B^1$, $D^1$, $E^1$ and $F^1$ are not actuated and the hammers for firing the bombs from these magazines merely come down and strike an empty recess and therefore do not project any bombs. Similarly the portions of the letter "F" designated $a^5$ $c^5$, $a^6$ and $a^7$ are formed by actuating the magazines and firing the bombs therefrom. These bombs are held in their recesses by the spring 9 and when the hammer strikes the firing pin 23 there is sufficient force to force the bomb past the spring 9. It is unnecessary to provide a large initial velocity to the speed of the bomb as gravitation force will affect the bomb in such a way that in 10 or 20 seconds of time the bombs will travel a considerable distance. In fact, the distance the bombs will travel between 10 and 20 seconds is approximately 5000 feet, so it is evident that a letter of considerable height may be formed. It is the custom in sky writing to obtain an altitude of several miles with the aeroplane and when at this altitude the letters may be formed in the sky a mile high, and a mile or better above the ground, so that there will be no danger of the bombs falling close to the ground before exploding.

It is possible, however, to explode these bombs simultaneously, that is, providing every bomb with a timing mechanism so that the same will explode say after it has fallen for a time interval of 10 seconds. When exploding the bombs simultaneously it is necessary to provide the bombs with different initial velocities so that one bomb will travel farther in 10 seconds than the other bomb. To do this it would be necessary to provide the bombs carried by the magazine $A^1$ with a small charge of powder or possibly none at all, so that the in-

itial velocity will be practically zero. The bomb fired from the magazine $F^1$ will be charged with a sufficient amount of powder to provide an initial velocity of approximately 250 or 300 feet per second, and the bombs fired from the intermediate magazines provided with sufficient charge to propel the bombs at speeds varying between zero and 300 feet per second. To obtain these varying charges for providing the initial velocity, is a matter of bomb designing and necessitates the carrying of larger or smaller charges of powder in the bomb, which are fired when the hammer strikes the firing pin. It is immaterial which method is followed, whether the bombs are provided with timing mechanism for exploding the same at different times, or are provided with timing mechanism to explode the same simultaneously and then additionally provided with charges for imparting various initial velocities to the bombs. Either method will form the letters as desired and the controlling means for controlling the firing of said bombs is identical.

What I claim is:

1. In a sky writing device, the combination of means for dropping a plurality of smoke bombs, means for exploding said bombs at different altitudes, and means for controlling the dropping of said smoke bombs at predetermined time intervals.

2. In a sky writing device, the combination of means for projecting a plurality of smoke bombs downwardly, means for exploding said bombs at different altitudes, and means for controlling the projecting of said smoke bombs at predetermined time intervals.

3. In a sky writing device, the combination of means for projecting a plurality of smoke bombs downwardly each provided with a timing mechanism for exploding the same at different time intervals, and means for controlling the projecting of said smoke bombs at predetermined time intervals.

4. In a sky writing device, the combination of means for projecting a plurality of smoke bombs timed to explode simultaneously, means for providing different initial velocities to said bombs, and means for controlling the projecting of said smoke bombs at predetermined time intervals.

5. In a sky writing device, the combination of means for projecting a plurality of smoke bombs each provided with timing mechanism for exploding the same simultaneously, means carried by the bombs for propelling the same at different initial velocities, whereby the said bombs are exploded at different altitudes, and means for controlling the projecting of said smoke bombs at predetermined time intervals.

6. In a sky writing device, the combination of means for projecting a plurality of smoke bombs, means for exploding said bombs at different altitudes, and a magnetic control for controlling the firing of said bombs at predetermined time intervals.

7. In a sky writing device, the combination of a plurality of magazines, each carrying a plurality of bombs, the bombs each having timing mechanism for exploding the bombs at different time intervals, whereby the bombs are exploded at different altitudes, and means for controlling the firing of said bombs from said magazines at predetermined time intervals.

8. In a sky writing device, the combination of a plurality of magazines each carrying a plurality of smoke bombs, means for projecting the bombs from any one or all of the magazines, means for exploding the said bombs at different altitudes, and means for controlling the projecting of said smoke bombs from the magazines at predetermined time intervals.

9. In a sky writing device, the combination of a plurality of moving magazines, each provided with a plurality of smoke bombs, means for firing the bombs from the magazines, means for exploding said bombs at different altitudes, and means for controlling the movement of said magazines for the purpose of firing said smoke bombs at predetermined time intervals.

In testimony whereof I have affixed my signature.

GEORGE HINEMAN.